

# Insights into the black box of a widely dispersing Galaxiid. What can otolith microstructure reveal?



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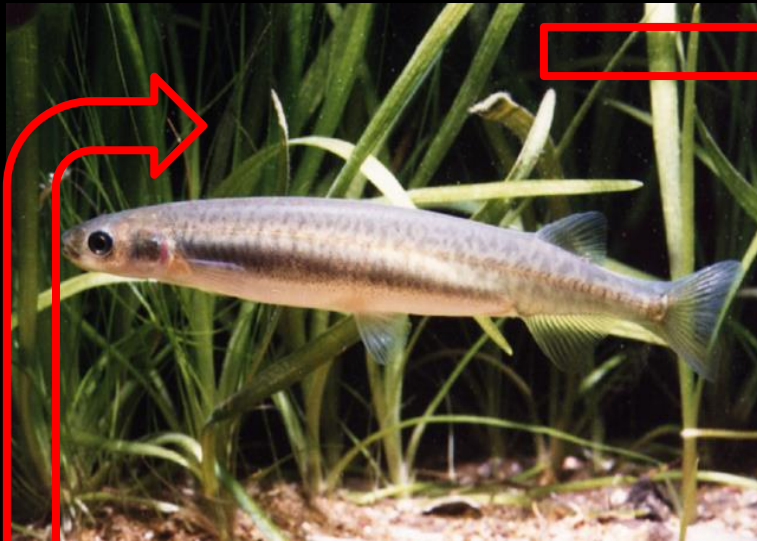
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NEW ZEALAND  
MARINE SCIENCES  
SOCIETY

  
TE HUNGA MĀTAI MOANA  
O AOTEAROA

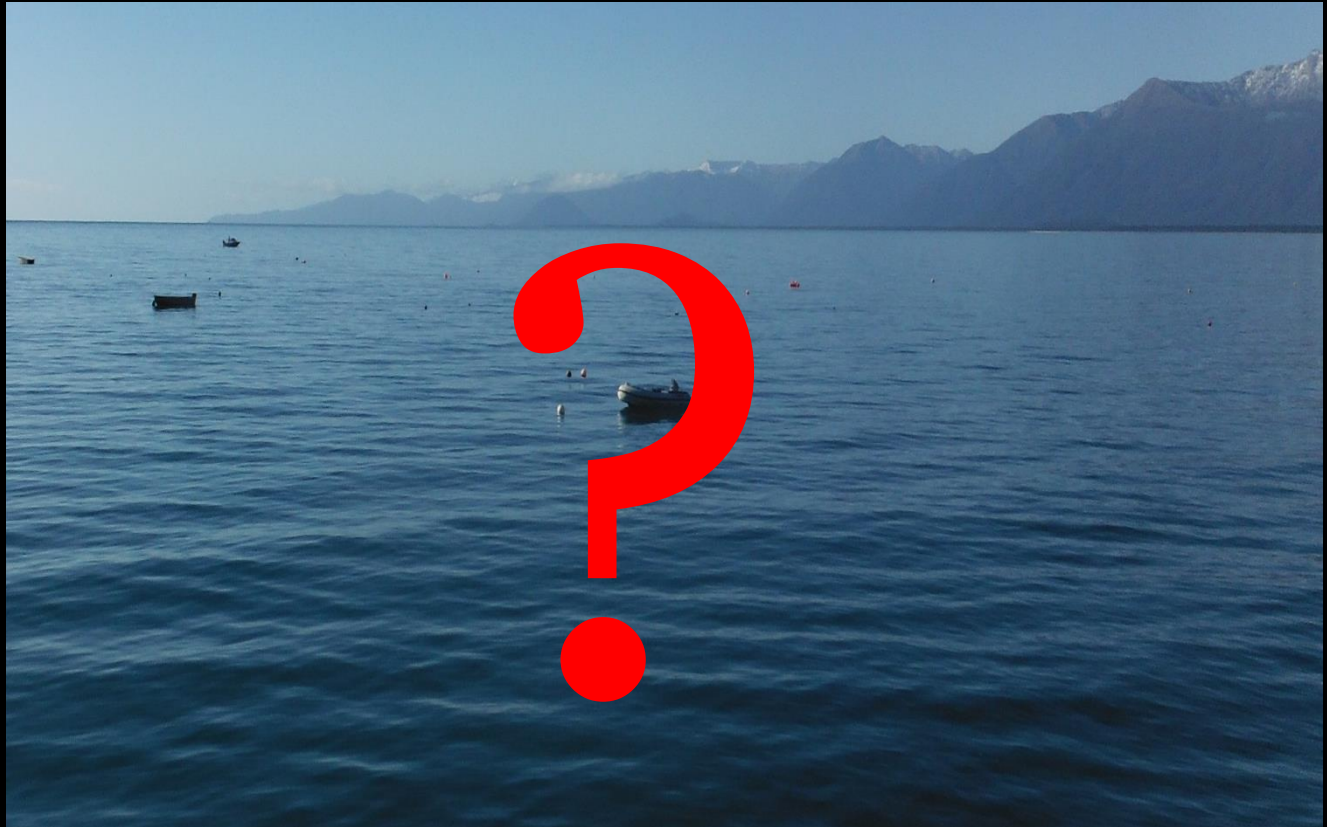


# Complex life cycle





# The black box



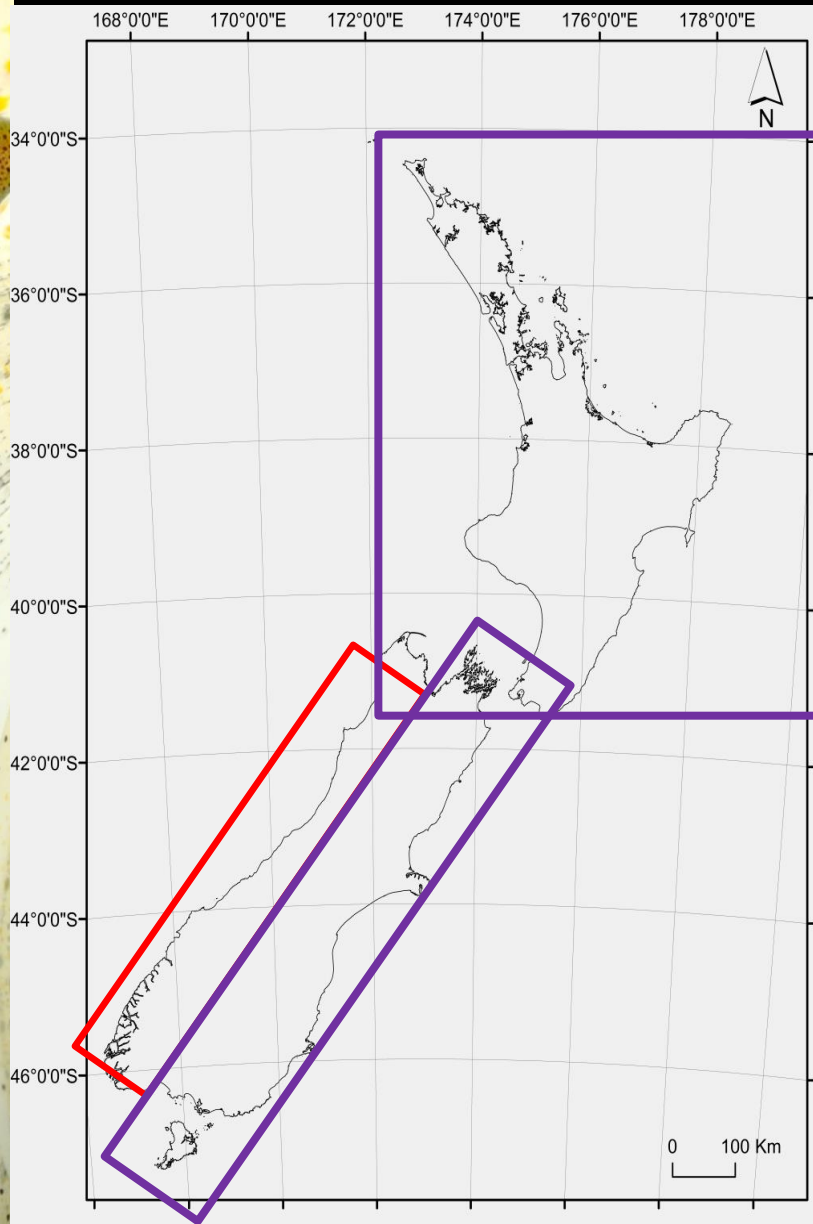
- Impeded conservation/management

# The Fishery

- >90% whitebait fishery
  - Cultural
  - Recreational
  - Commercial
- Multispecies fishery
  - 5 migratory Galaxiids
- Department of Conservation
  - “Precautionary approach”
- Control whitebaiters behaviour
  - No quotas
  - Fishing pressure
  - Licences
  - Monitoring



# Fishery management

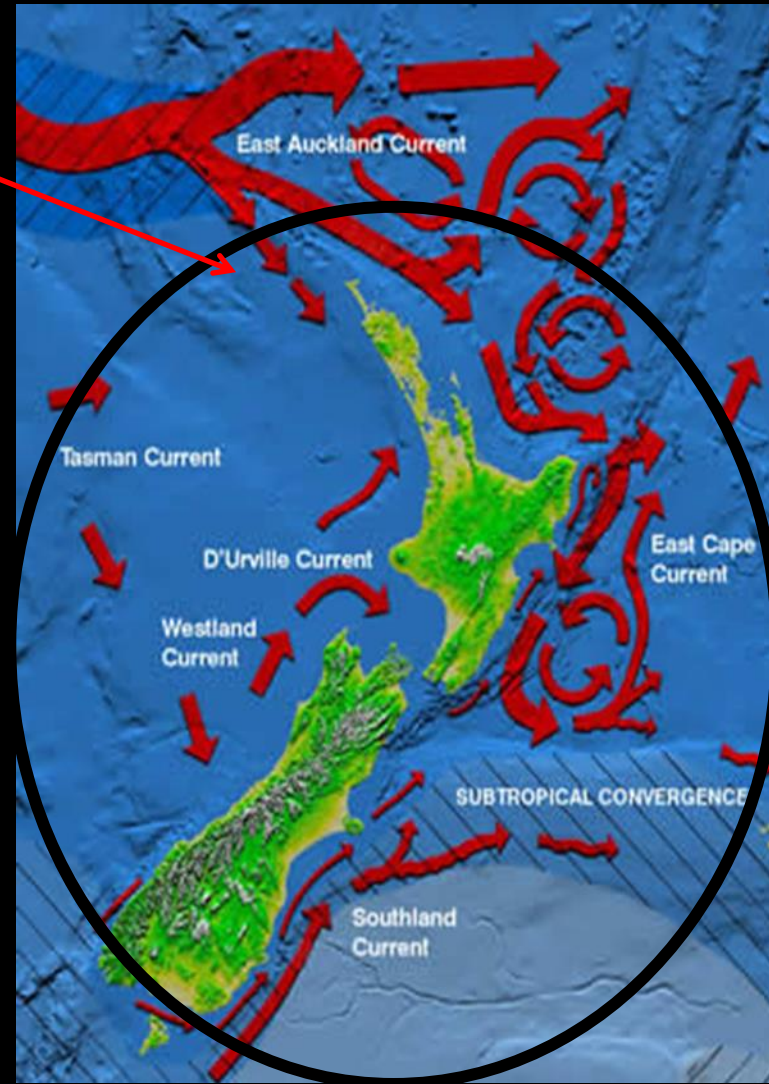


- Management units
  - “Rarer whitebait”
- Conservation status 2013 “**at risk**”
- Biology
  - “One size fits all”
  - Homogenous
  - 13° latitude

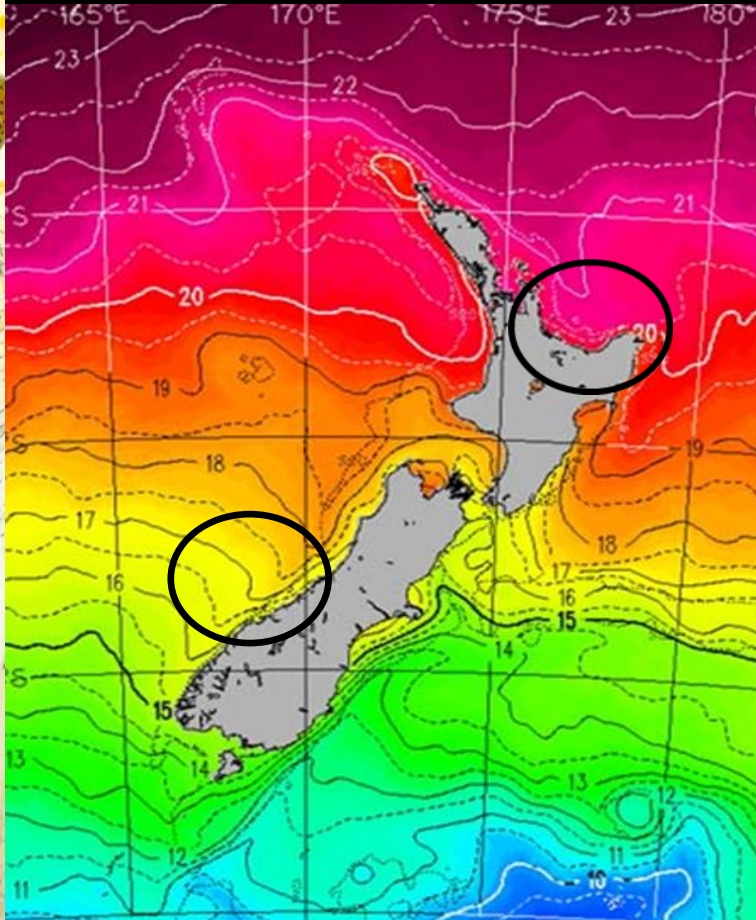


# Populations are not homogenous

- Genetic
  - Panmixia
  - Structure (allozymes)
- West to east exchange
- Freshwater/Estuarine residents
- Discrete populations
  - Mean vertebrae no.
- Batch vs Total spawners
- Spawning time



# Marine Life



**Mean SST  
1993-2002**

- Population variability
  - Biocomplexity
- Platform
  - Temperature
  - Food
- Larval history
  - Precursor to adult growth
  - Slow growth
  - Fast growth





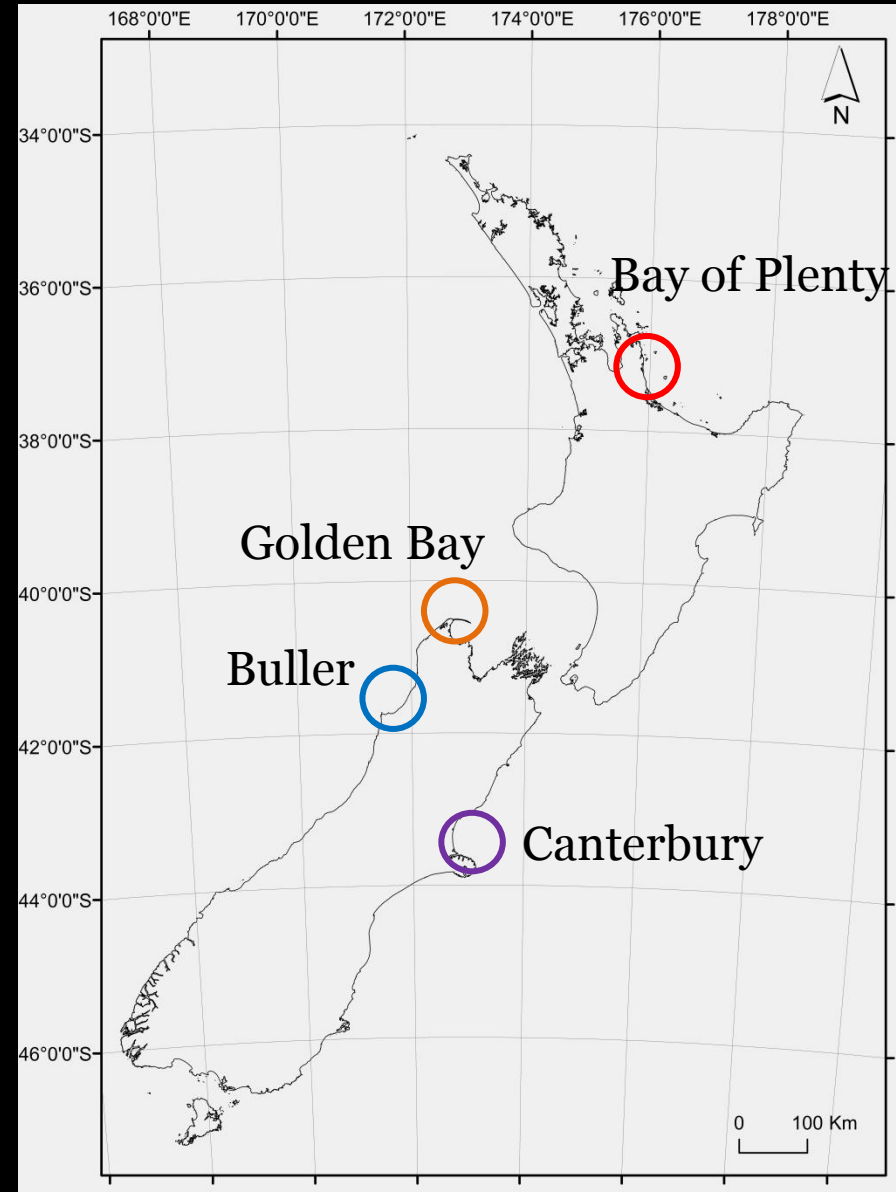
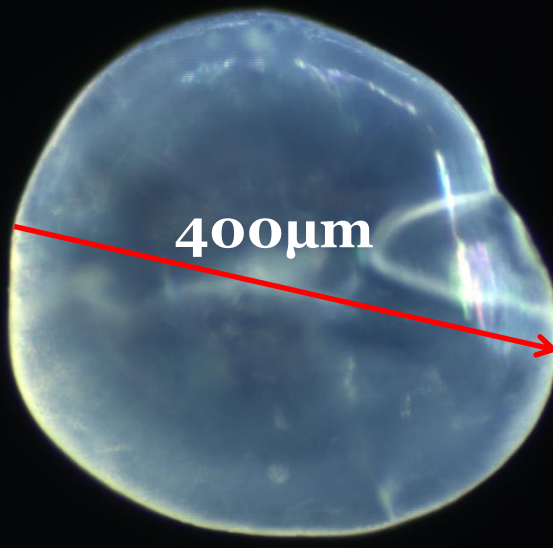
# Aims

- Explore the “**black box**” of marine dispersal
- **Characterise larval traits of populations** throughout New Zealand
- $H_0$ ; There is no **intra-regional** difference in the **larval traits** of *G. maculatus* in space or time



# Methods

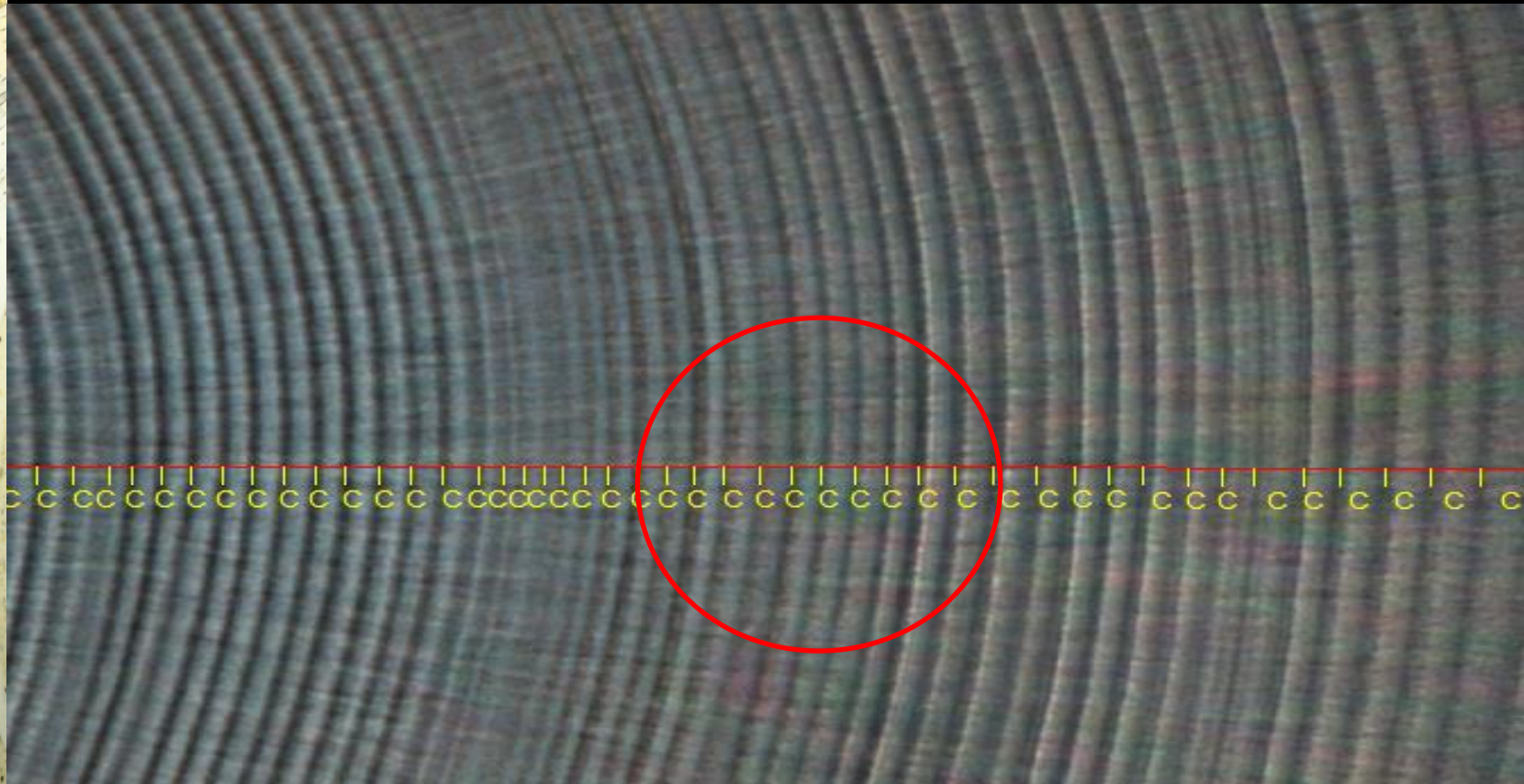
- 4 key fisheries
  - 3 rivers
  - Sept- Dec
- Length & weight
- Extracted
- Polished
- Photographed



# Otolith microstructure

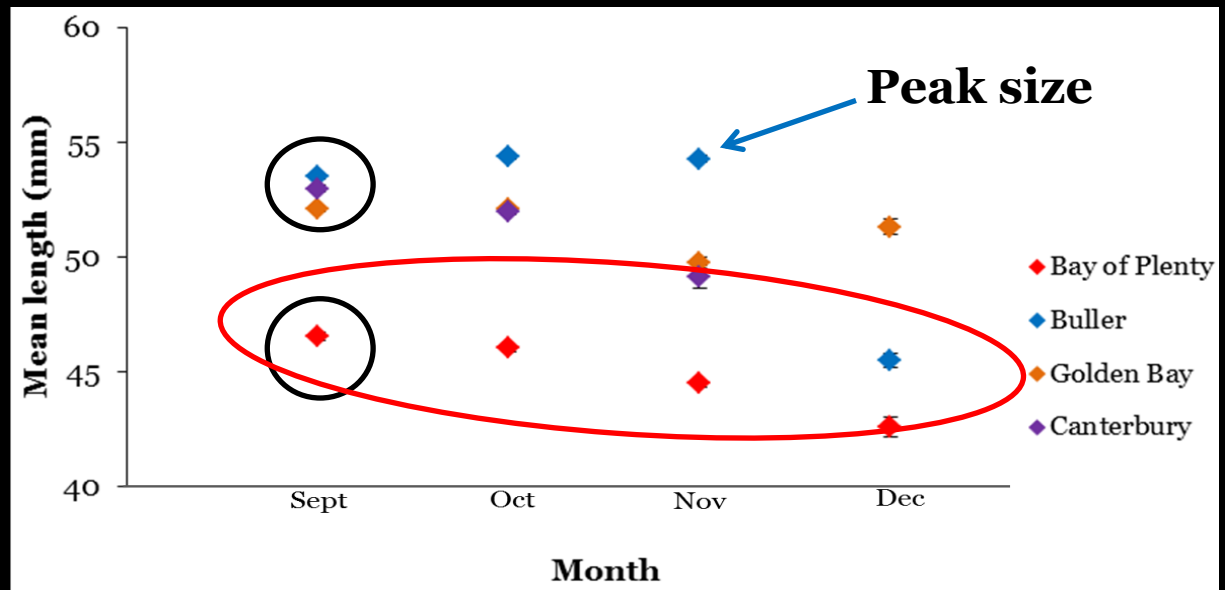
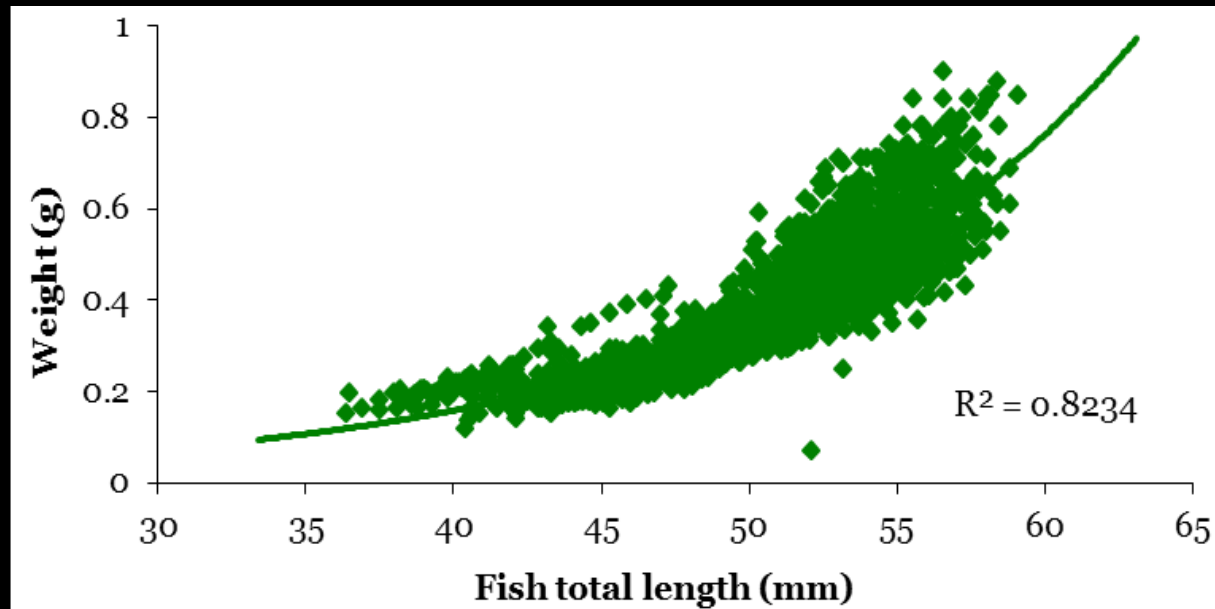
Counts  $\longrightarrow$  Pelagic larval duration

Width ( $\mu\text{m}$ )  $\longrightarrow$  Growth per day

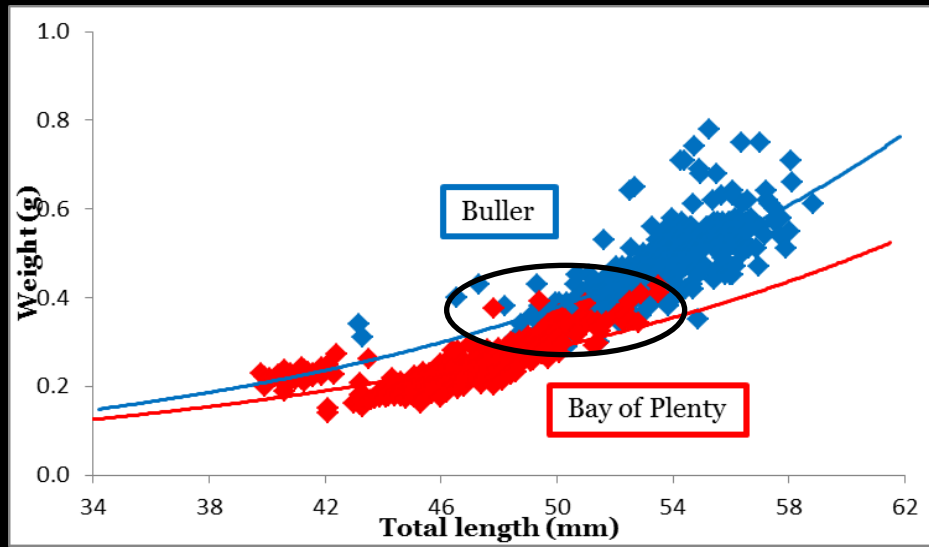




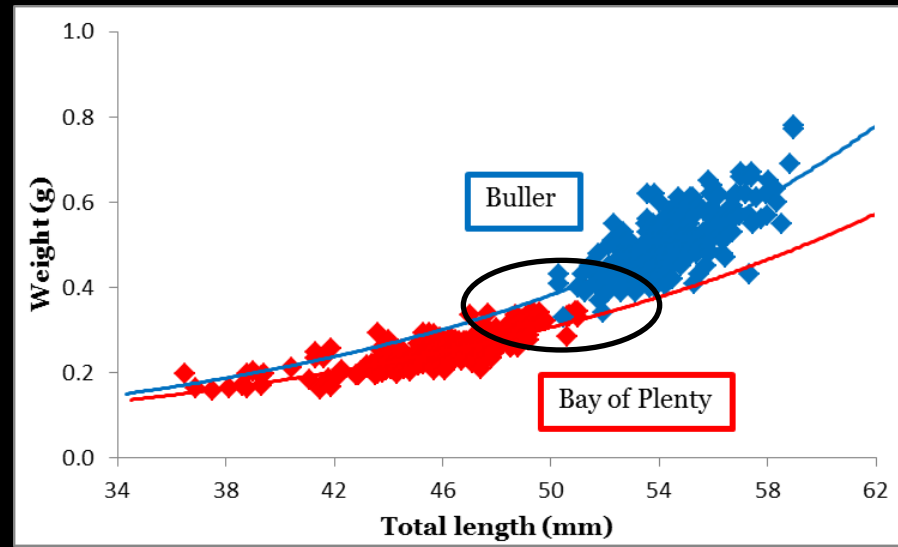
# Growth relationship



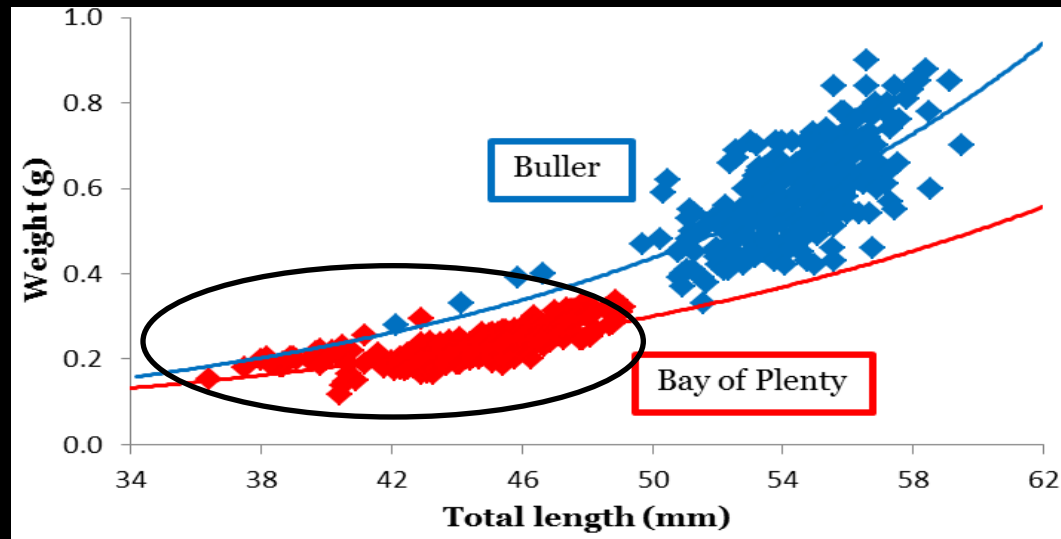
# Size at recruitment



September



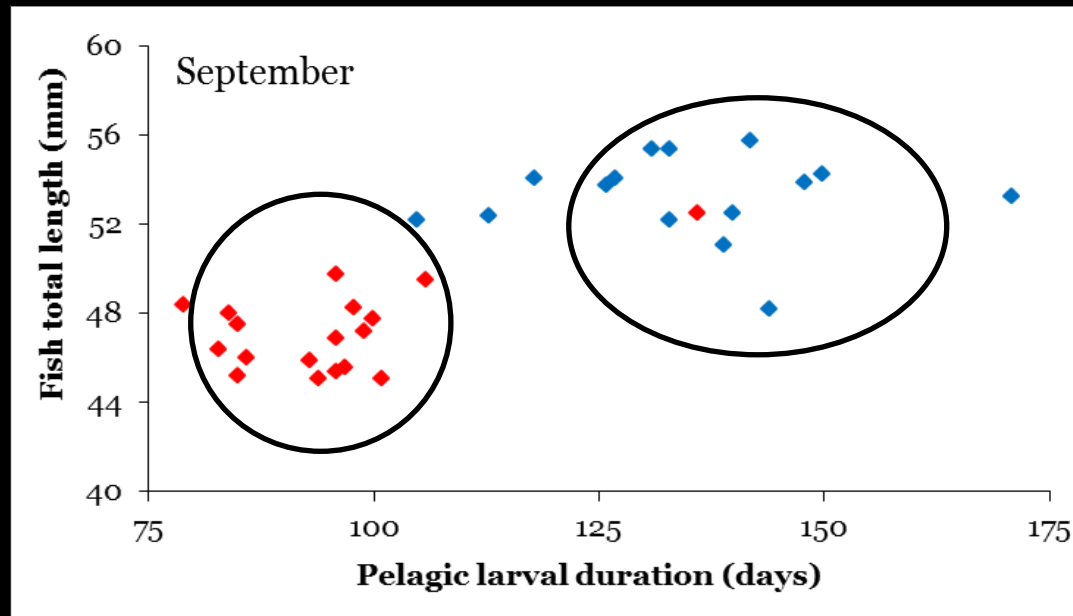
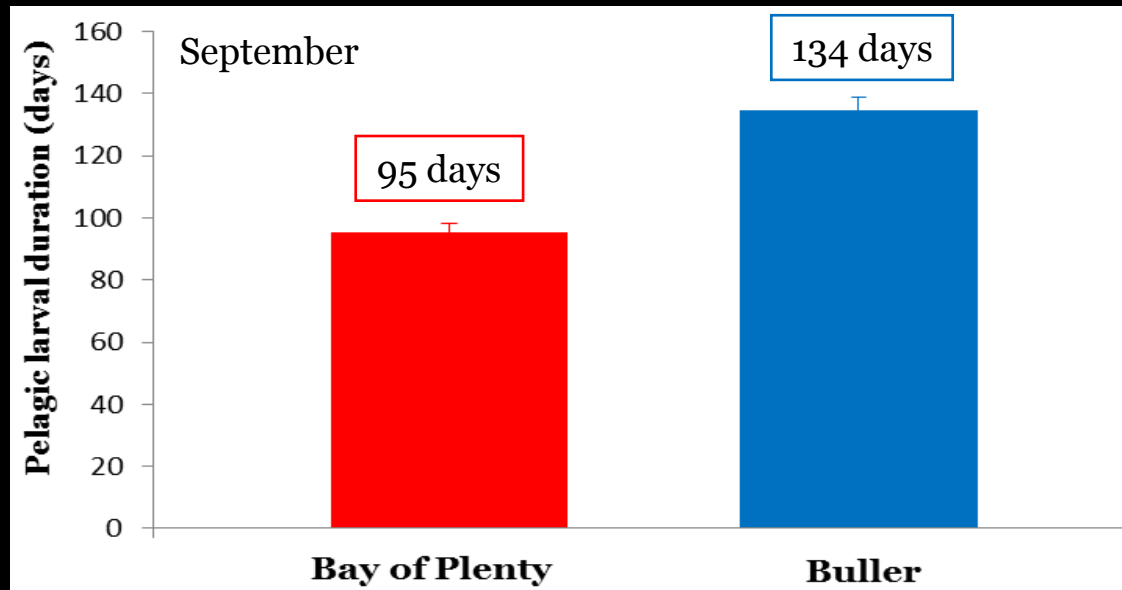
October



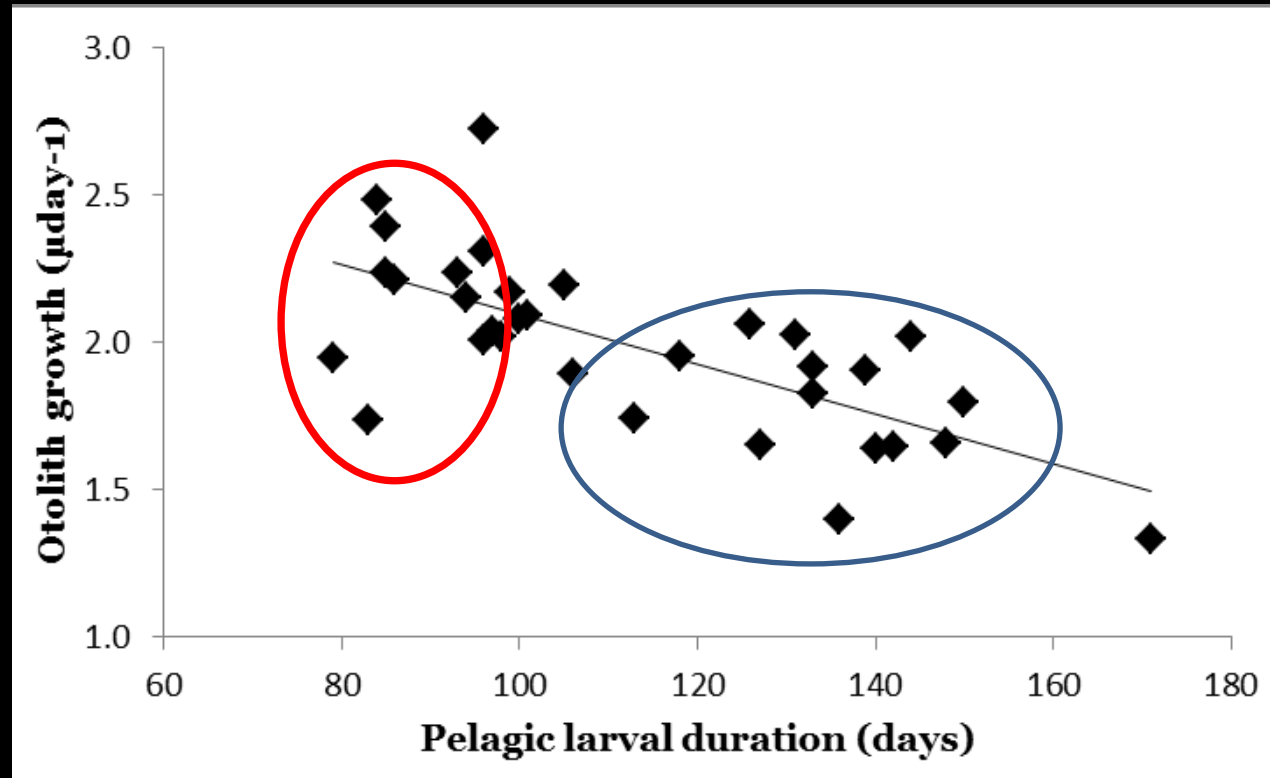
November



# Pelagic larval duration differs



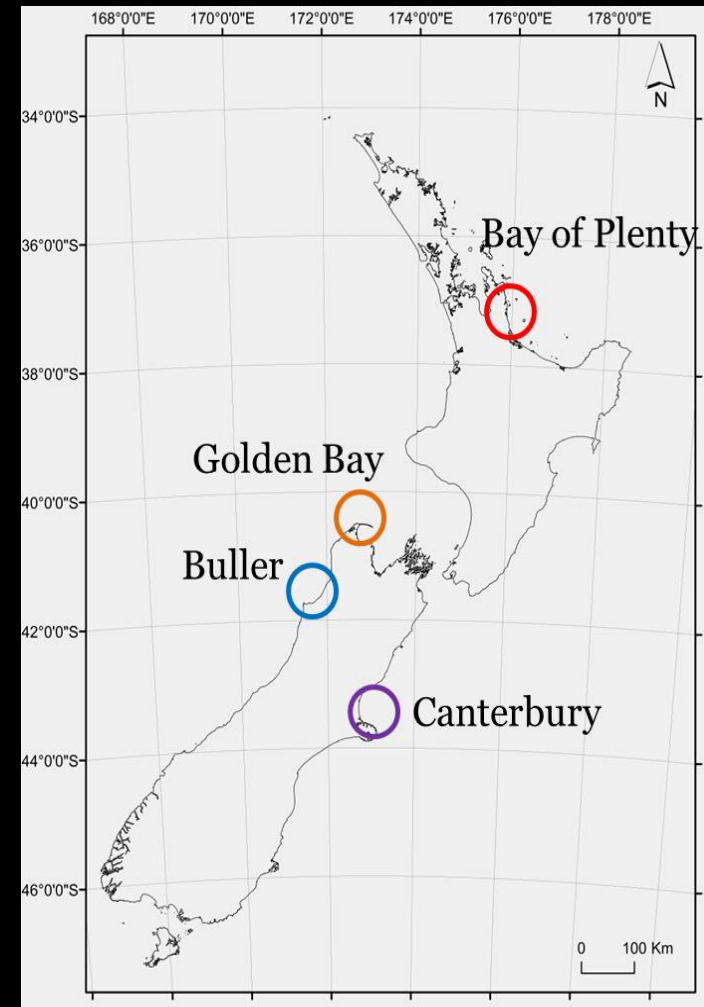
# PLD vs otolith growth





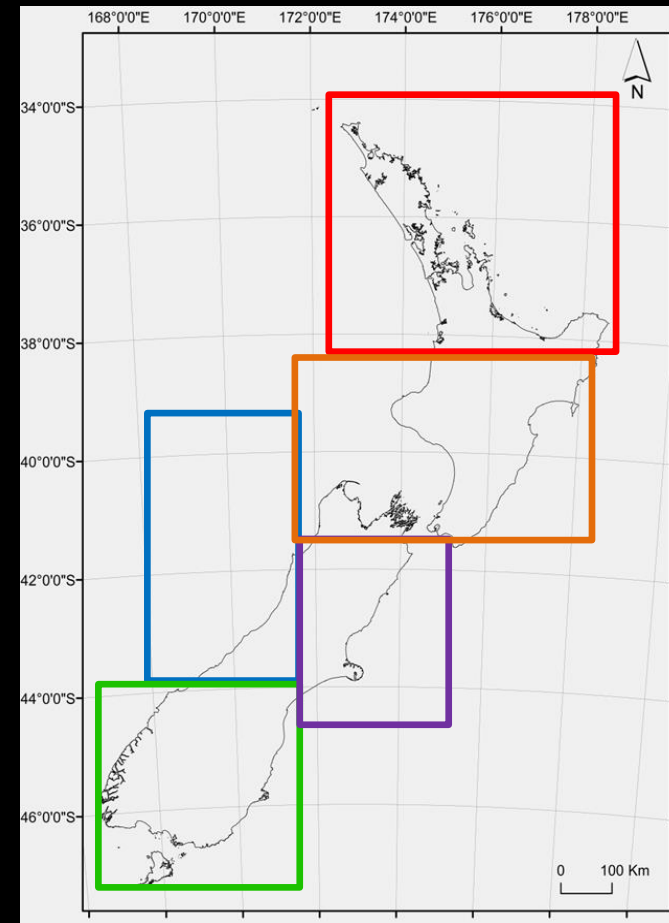
# Conclusion

- Larval histories are different
- Bay of Plenty
  - Smaller size
  - Faster growth
  - Shorter PLD
- Buller
  - Larger size
  - Slower growth
  - Longer PLD
- Geographic variation



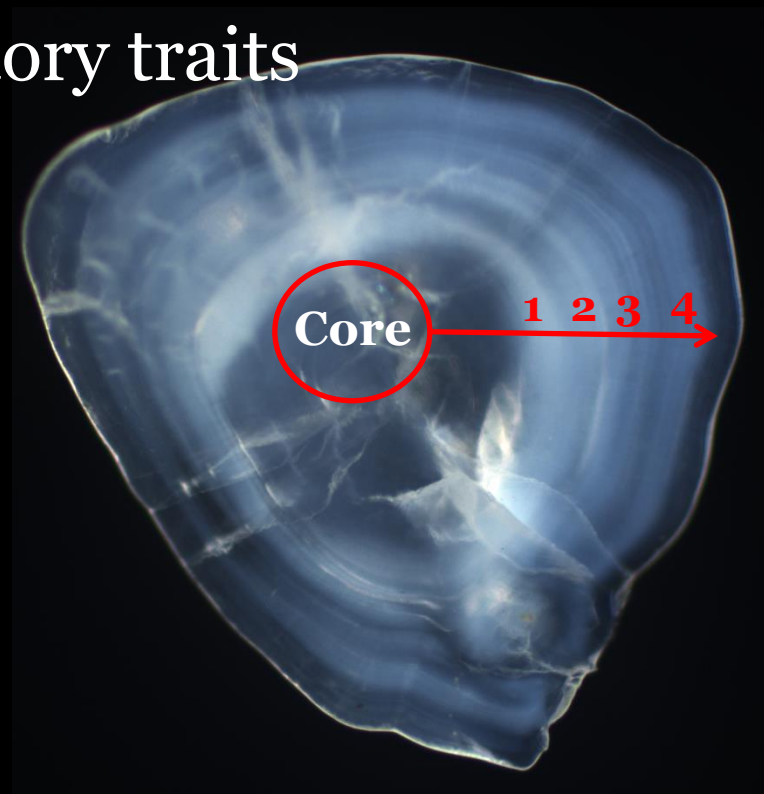
# Consequences

- Demographic structure
  - Size selective mortality
  - Age at sexual maturity
  - Reproductive mode
  - Fecundity
  - Survival probability
- Management
  - Temporal
  - Spatial



# Future Research

- Otolith shape
  - Discriminate populations
- Construct demographic models
  - Distribution of life history traits
  - Age adult populations





# Acknowledgements

- Funding
  - Ministry of Business, Innovation and Employment (Co1X1002)
- Jan McKenzie
- The gang at Tauranga Marine Station especially Diana, Dave, Rex, Mark and Chris
- Thanks to all the lovely whitebaiters I met on the rivers that supplied me with fish for my research

